

Teat Scoring as a Management Tool

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Summary

Regular monitoring of level of teat end hyperkeratosis and other teat lesions within a dairy herd can be an extremely useful tool for monitoring the effectiveness of both the milking machine and the milking routine.

While a single teat score of the herd can be helpful, the most benefit is obtained when scoring becomes a regular part of the management routine so that changes can be monitored and reacted to in time. Regular teat condition scoring should be considered as important a management tool as regular mobility or body condition scoring.

In addition to regular scoring, additional scores can be carried out before and after major changes to the milking machine or the milking routine to act as a benchmark and monitor.

Introduction

There are numerous factors which can influence the condition of the teats of a dairy cow. When farmers discuss teat condition, they are invariably describing teat end hyperkeratosis, an example of which can be seen in Fig. 1.



Fig. 1 - Teat end hyperkeratosis

However, there are many other teat lesions and teat changes which can be measured and monitored which will provide an essential insight into what is happening during the milking process.

Some of the other important changes which can be measured would include:

- Post milking teat colour

- Firmness of the teat barrel
- Openness of the teat orifice
- Tissue ringing at the base of the teat
- Dryness of the teat

Discoloured teats after milking are highlighted in Fig. 2.



Fig. 2 - Teat discolouration after milking.

When changes occur to a cow's teats after milking, these changes can be considered to fall into three categories. These changes are either:

- attaches to the udder and the degree of openness of the teat orifice.
- Medium term changes (usually take a few days to develop) include changes in the teat skin condition and the incidence of petechial haemorrhages (blood blisters).
- Long term changes (normally take a number of weeks to develop) include the amount of teat orifice hyperkeratosis. However, when the environment is particularly harsh and the weather particularly cold or windy, hyperkeratosis can develop more rapidly.

The role of teat lesions

The teat canal is the primary physical barrier to invasion of pathogens into the udder. The smooth muscles which surround the teat canal should be contracted and the teat canal tightly closed between milkings to prevent pathogens entering the teat canal and then the udder.

This defence is aided by mature, lipid rich keratin cells lining the teat canal. In Fig. 3, the keratin lining of the teat canal has been stained red, and shows the convoluted nature of the canal. The keratin traps

mastitis pathogens as they attempt to pass through the canal and these pathogens are then naturally removed from the udder during the milking process, when the shearing effect of milk flowing through the canal removes the outer layer of keratin.



Fig. 3. - Section of teat end (Photo courtesy of Utrecht University)

When the teat end is in good condition and not rough or damaged and the skin of the teat is soft and supple, the teat is best placed to provide a natural barrier to the invasion of mastitis causing pathogens.

Any short term challenges to a teat can result in a reduction in the teats natural ability to resist bacterial challenge. While most attention is focused on teat end hyperkeratosis, the presence of other short term teat conditions such as discolouration, oedema, teat end wedging and congestion are less well recognised. However, studies in Holland have confirmed any form of circulatory impairment can be associated with an increase in the risk of sub-clinical mastitis infection.

When teat skin becomes dry, as well as often leading to an increase in teat end hyperkeratosis, the teat barrel becomes harder to clean. This can lead to an increased risk of infections caused by environmental mastitis pathogens such as *Strep. uberis*. Any open lesions on the teat skin can harbour contagious pathogens such as *Staph. aureus*. These lesions also cause discomfort for the cow during milk harvesting and can result in poor milking out. Fig. 4 illustrates a dry teat which will be difficult to clean.



Fig. 4 - Dry teat skin condition

Practical teat scoring

There have been a number of papers published by Teat Club International since 2001 describing the best practice for scoring and evaluating teat changes on dairy cows. It is obvious that teat condition assessments must be unobtrusive, well rehearsed and relaxed. Any interruption in the milker's routine, cow flow or cow behaviour caused by insensitive teat scoring can adversely influence the parameters which are being assessed.

For example, if teat scoring leads to a disruption in the normal milking routine or adversely effects cow flow into or out of the parlour, particularly in situations without automatic cluster removers, this may result in more discoloration and oedema than would typically be seen on the farm.

There are a number of recommendations to follow when examining teats:

- Teat condition should always be evaluated immediately after the cluster is removed (within 30 seconds) and before the disinfectant is applied.
- animals are not used to physical teat examination.
- Teats should be observed and recorded in a regular and methodical pattern.
- Use a head torch and dictation machine to ensure hands are kept free for examination of teats.
- View the teats, initially, without handling.
- Any teat ends with milk residue or debris on the orifice should be wiped with an individual paper towel to improve the view of the orifice.

- View teats by gently grasping the teat above the teat end. Observe the teat from side on and then end on.
- Score all teats of at least 80 cows or 20% of the herd, to provide an adequate sample size. It is important to score a representative sample of cows from all feed and management groups, taking account of stage of lactation and parity.
- Follow good standards of hygiene, thoroughly cleaning and disinfecting gloved hands after handling teats of cows with mastitis.

Assessing incidence of teat lesions

When assessing many of the short term teat changes, it is important to be able to establish the severity of what is being recorded. Normal teat colour should be recorded, as should teats which are red and blue. Blue discolouration is considered more severe than red discolouration.

Ring at the base of the teat can be considered to be either absent, visible or palpable with a palpable ring considered the most serious.

Examinations of the barrel of the teat should confirm that a teat is either normal or firm.

Teat skin condition is also quite easy to assess. A teat will either be considered to be normal or dry. If a teat is dry this is a problem and therefore scoring as dry or very dry is not particularly helpful.

With the majority of these lesions, the intervention level is breached when more than 10% of teat examined show adverse changes.

Assessing levels of Hyperkeratosis

Scoring teat end hyperkeratosis is slightly more complicated with four categories to consider. Several systems have been developed over the years to allow objective measurement of hyperkeratosis. Many of these scoring systems are complicated and best suited to the controlled environment of a research project.

In an attempt to provide a simple and reliable method to assess teat end hyperkeratosis which can be accepted as an international standard, the Teat Club International proposed a set of guidelines for observing teat condition and interpreting the findings. These guidelines were particularly targeted at extension workers, veterinary surgeons and farm managers.

For routine field evaluation, teat end hyperkeratosis can be considered to fall into four classes. This is demonstrated in Fig. 5.

- No ring where the teat end is smooth with a small even orifice. (**Score N**)
- Smooth or slightly rough ring where a raised ring encircles the orifice. The surface is smooth or very slightly rough. No keratin fronds evident (**Score S**).
- Rough ring where a raised, roughened ring has fronds of keratin extending 1 - 3mm from the orifice. (**Score R**)
- Very rough ring where the keratin extends more than 4mm from the orifice. The rim of the ring is often cracked. (**Score VR**)





Score	Description	Illustration
N	No ring The teat-end is smooth with a small, even orifice. This is a typical status for many teats soon after the start of lactation	
S	Smooth or Slightly rough ring A raised ring encircles the orifice. The surface of the ring is smooth or it may feel slightly rough but no fronds of old keratin are evident.	
R	Rough ring A raised, roughened ring with isolated fronds or mounds of old keratin extending 1 - 3 mm from the orifice.	
VR	Very Rough ring A raised ring with rough fronds or mounds of old keratin extending 4 mm or more from the orifice. The rim of the ring is rough and cracked, often giving the teat-end a "flowered" appearance.	

Fig. 5 - Teat end hyperkeratosis scoring system

It is usually very difficult to determine which of many factors may be affecting the levels of hyperkeratosis within a herd. However, further investigations of the milking machine and the milking routine would be recommended if more than 20% of teats score R or VR, or more than 10% score VR. If a cow has one or more teats with a problem condition then that cow is considered to have a problem.

Potential causes of adverse teat conditions

There are numerous factors which can affect the amount of teat end hyperkeratosis recorded including teat end shape, milk yield, peak milk flow rate, duration of milking and overmilking, stage of lactation, parity, teat skin condition and the interaction between the milking routine and the

milking machine. The total time per day where the milk flow rate is less than 1.0 kg/min appears to have a significant effect on the level of hyperkeratosis found.

This in turn is influenced by pre-milking teat preparation, the period of time between teat preparation and cluster attachment, ACR settings and working plant vacuum level. Cows which are thoroughly prepared prior to cluster attachment exhibit improved milk let down which leads to shorter and more complete milkings, with a clearly defined end of milk flow.

When there is evidence of bimodal milk let down or over milking, this is often associated with increased levels of hyperkeratosis (Fig. 6).

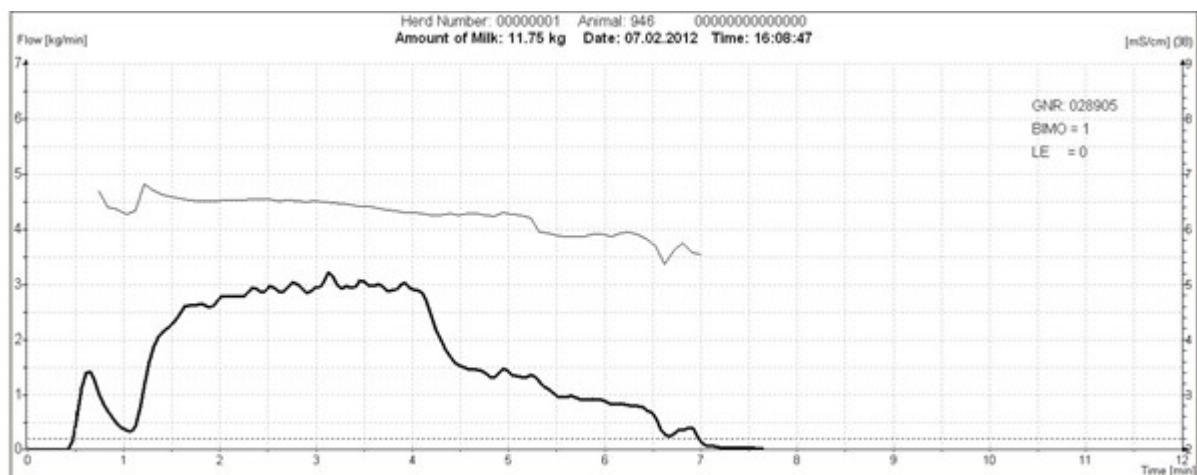


Fig. 6 - Bimodal milk let down

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In general, hyperkeratosis is more severe with long, pointed teats, slow milking cows or higher producing cows. Teat scores change with stage of lactation and parity, increasing some 3 - 4 months post partum and declining as the lactation progresses. The Australian Countdown Down-under

Milk quality programme (www.countdown.org.au) has produced a summary table linking risk factors for increased levels of hyperkeratosis. This is demonstrated at Fig. 7.

Risk Factor	Reason for increased likelihood of teat end hyperkeratosis
Pointed teats	The load applied by the closing liner acts on a smaller area of teat surface
Increasing age	The "wrinkle" factor in all species
Higher production	Cups are on for longer
Peak lactation	Cups are on for longer
Cluster on before milk let down	Increased period of milk flow < 1.0kg / min
Low threshold for ACRs	Increased period of milk flow < 1.0kg / min
Over-milking	Increased period of milk flow < 1.0kg / min
High vacuum	Increased stress on teat tissues

Fig. 7 - Risk factors for increased levels of hyperkeratosis

A number of other risk factors for commonly reported teat conditions are illustrated in Fig. 8.

	Teat colour	Swelling at the base	Firmness/hardness of the teat end		Open orifice
Observation	Red/blue	Ringling	Hard	Wedge	Diameter
<i>Machine factors</i>					
High milking vacuum	√	√	√		√
Faulty pulsation	√		√	√	
Short D-phase	√		√		
Long D-phase				√	
Liners - wide bore	√		√		√
- aged	√	√			
- high tension	√			√	√
Mouthpiece	√	√			
- large chamber					
- small lip diameter	√	√			
- stiff lip		√	√		
Mismatch of liner and teats	√	√			√
<i>Milking management</i>					
Long low flow times	√	√	√		
Over-milking	√	√	√		√
Teat cup crawling		√			

Fig. 8 - Primary causes or exacerbating influences on short-term teat conditions

The use of regular teat condition scoring as a milk quality management tool

As well as being an important consultancy tool, farm staff can be trained to undertake routine assessments of levels of teat lesions within a herd, identifying emerging problems quickly to allow rapid rectification.

Even if it not possible to come up with a definitive diagnosis for a particular teat condition identified, if it is possible to report an increase in the number of blue teats or an increase in the number of teats with a VR hyperkeratotic ring since the last scoring, this information can be passed to a veterinary surgeon or milking technology specialist to identify the reason for the deterioration.

The most important point is that the changes are identified early and trends followed so that if there are problems developing, these are identified and resolved quickly.

Recording and analysing the data collected can be time consuming so using spreadsheets already designed for the purpose can ease matters significantly. The University of Wisconsin hosts a teat scoring recording spreadsheet which allows data capture and analysis in two easy steps. The spreadsheet can be downloaded free (<http://milkquality.wisc.edu/milking-management/evaluation-tools>) and makes record keeping relatively straightforward.

Conclusions

Accepting that regular and routine teat condition scoring is as important a management technique as monitoring mobility and body condition scoring will

ensure that potential problems which can affect milk quality and mastitis are identified early and addressed before they cause significant financial losses.

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